## REMARKS

Applicant has amended Claim 1 to read: "A method consisting of making a stamp for microcontact printing, said method substantially eliminating pattern distortion of said stamp formed as a result of said method, said method consisting of..." This language makes the claim very specific to the elements stated. As noted previously, the claim is specifically limited to a "stamp" by virtue of the "consisting of" language in the claim.

The Examiner is respectfully requested to reconsider the rejection of Claims 1, 7 and 8, under 35 U.S.C. 103(a) as being unpatentable over Everhart, et al. (U.S. Patent 5,922,550) in view of Sangokoya (U.S. Patent 5,731,253), further in view of Franses, et al. (U.S. Patent 4,743,507).

It is respectfully submitted that the Examiner has cited references that are non-analogous art to the specific application comprising Applicant's invention. Everhart discloses micro-contact printing but there the similarity ends. The Everhart invention is *micro-contact printing of analyte-specific receptors onto a metallized plastic film which allows for the development of single use, disposable biosensors based upon light diffraction to indicate the presence of the analyte*.(Column 5, lines 5 - 10). The skilled artisan would have noted that the invention relates to the use of the element prepared (using the method disclosed) via a biosensor to detect microorganisms on contact lenses, eyeglasses, window panes, pharmaceutical vials, solvent containers, water bottles, band-aids and the like to detect contamination (Column 3 to line 46; detecting and quantifying microorganisms such as bacteria, yeast, fungi and viruses (Column 4, lines 61 - 67). The Everhart reference is a variation of the references cited on page 1 of the specification, lines 8 - 13). The Kumar article referred to at page 1, like Everhart relates to the use of alkane thiol ink with a gold surface on the stamp.

Column 9, etc. of Everhart teaches the self-assembled monolayers, i.e., gold film on a titanium primed substrate. The Examiner asserts that Everhart shows "*that it is know to carry out a method consisting essentially of making a stamp for microcontact printing, said method substantially eliminating pattern distortion of said stamp formed as a result of the method*" citing

Column 9, lines 35-38. The Examiner further cites Column 9, lines 35 - 48 to support her assertion that polysiloxane oligomer-monomer mix is cured in a closed system in a two stage curing process, etc...

In fact, Everhart does not disclose what the Examiner asserts as stated in the Official Action.

To clarify, Everhart states verbatim:

"FIG. 2 outlines the procedure used for microcontact printing. An elastomeric stamp is used to transfer alkanethiol "ink" to a gold surface by contact; if the stamp is patterned, a patterned self-assembling monolayer forms. The stamp is fabricated by casting polydimethylsiloxane (PDMS) on a master having the desired pattern. Masters are prepared using standard photolithographic techniques, or constructed from existing materials having microscale surface features.

In a typical experimental procedure, a photolithographically produced master is placed in a glass or plastic Petri dish, and a 10:1 ratio (w:w or v:v) mixture or SYLGARD.RTM. silicone elastomer 184 and SYLGARD.RTM. silicone elastomer 184curing agent (Dow Corning Corporation) is poured over it. The elastomer is allowed to sit for approximately 30 minutes at room temperature and reduced pressure to degas, then cured for 1-2 hours at 60.degree. C., and gently peeled from the master. "Inking" of the elastomeric stamp is accomplished by exposing the stamp to a 0.1 to 1.0 mM solution of alkanethiol in anhydrous ethanol, either by pouring the solution over the surface of the stamp, or by rubbing the stamp gently with a Q-TIP.RTM. that has been saturated with the inking solution. The stamp is allowed to dry until no liquid is visible by eye on the surface of the stamp (typically about 60 seconds), either under ambient conditions, or by exposure to a stream of nitrogen gas. Following inking, the stamp is applied (typically by hand) to a gold surface. Very light hand pressure is used to aid in complete contact between the stamp and the surface. The stamp is then gently peeled from the surface. Following removal of the stamp, the surface is washed of excess thiol and the patterned gold surface can be subjected to chemical etchants (see below) that selectively remove underivatized areas of the gold surface, and if desired, the underlying support(s). Alternatively, further derivatization of unstamped areas can be accomplished, either by using a second stamp, or by washing the entire surface with a different alkanethiol.

The elastomeric character of the stamp is important to the success of the process. Polydimethylsiloxane (PDMS), when cured, is sufficiently elastomeric to allow good conformal contact of the stamp and the surface, even for surfaces with significant relief; this contact is essential for efficient contact transfer of the alkanethiol "ink" to the gold film. The elastomeric properties of PDMS are also important when the stamp is removed from the master: if the stamp were rigid (as is the master) it would be difficult to separate the stamp and master after curing without damaging one of the two substrates. PDMS is also sufficiently rigid to retain its shape, even for features with sub-micron dimensions: we have successfully generated patterns with lines as small as 200 nm in width. The surface of PDMS has a low interfacial free energy (y=22.1 dynes/cm), and the stamp does not adhere to the gold film. The stamp is durable in that the same stamp can be used up to 100 times over a period of several months without significant degradation in performance. The polymeric nature of PDMS also plays a critical role in the inking procedure, by enabling the stamp to absorb the alkanethiol ink by swelling. Produce printing roll for stamp to allow for a continuous printing operation.

Microcontact printing on gold surfaces can be conducted with a variety of alkanethiol "inks". Alkanethiols that do not undergo reactive spreading (after application to the gold film) are required for formation of small features with high resolution. For stamping in air, one can use autophobic alkanethiols such as hexadecanethiol. Microcontact printing of other non-autophobic alkanethiols, for example, $HS(CH_2)_{15}COOH$, can be conducted by stamping under a liquid such as water. Patterned self-assembling monolayers of alkanethiols on gold provide excellent resist character with a number of wet-chemical etchants..."

There is no mention made of the 2 phase curing system under the conditions defined by Applicant in Claim 1 nor of any of the other limitations found therein.

The present invention forms a microcontact printing stamp which possesses a minimum degree of printing distortion. (Emphasis Added). The method of making the improved stamp of the present invention which stamp has a pattern for microcontact printing utilizes a siloxane composition as now defined specifically in Claim 1, wherein the siloxane composition is cured to fix its geometry while at or near the intended final use temperature (room temperature), followed by a higher temperature step to harden the siloxane composition, without substantially inducing

geometry changes to the stamp and the pattern. Everhart does not teach the specifics of what Applicant claims.

More particularly, the present invention comprises a simple technique with respect to microcontact printing stamps, to achieve both the required dimensional integrity for pattern faithfulness and desired mechanical properties, primarily high elastic modulus. It teaches that with the vinyl addition type siloxane precursor mixtures (and others), where crosslinking (curing) can take place at either room temperature or higher temperature, a two-step cure produces the desired combination of properties.

The first step is a room temperature cure, since generally room temperature is the condition at which the stamp will be ultimately used. The stamp is allowed to crosslink at room temperature for some period. During Applicant's curing time, the stamp crosslinks and fixes the overall stamp geometry and the printing pattern in a manner far superior to and not contemplated by the prior art. Everhart does cure, but not the two-step method taught and claimed by Applicant.

After this curing step is completed, the second step commences wherein the stamp is brought to a much higher temperature, of between about 50 °C and 120 °C, at which temperature a further cure continues thus attaining a higher elastic modulus. Upon cooling back to room temperature, the original pattern is restored without distortion and the stamp has the desired higher modulus.

The two-step processing described above is used with the intention of using the first step to establish the precise dimension of the molded pattern. The step establishes not just the relative geometry, but also the resulting dimension by being held at a precise temperature within an enclosed mold. Then, once this dimension has been irrevocably established, the material is heated to a higher temperature for hardening.

Even though the material will (and does) expand during the higher temperature curing, it will (and does) shrink back to its original dimension again after cooling to the final use temperature.

Applicant has explained in the specification that there are a number of sources for severe pattern distortion in the standard curing process. One reason for the distortion is that each component of the mold, including the master with glass and photoresist, flexible backplane, spacers, and mold housing expands with temperature changes according to the CTE of each. Thus, each component of the structure, being made of a different material with a different coefficient of expansion, expands disproportionally relative to each other, and to the original intended pattern. These will be the dimensions in place at the time of curing when the siloxane hardens into a stamp, and the pattern becomes fixed. Everhart is not concerned with these factors.

At this point, with the oven hot and after sufficient time for curing, the stamp possesses a pattern dimension that is related to the original master pattern according to the composite CTE of the master glass and photoresist. As the glass and photoresist will have expanded more or less uniformly, the stamp pattern will differ from the original in a relatively predictable way, which would be able to be reasonably compensated for by choice of an appropriately scaled master pattern to begin with. This sequence would produce a useful product if this were the end of the fabrication process, but it is not. Before the stamp is separated from the mold, the entire assembly must first be cooled down. During cooling, the master will shrink according to its moderate CTE (maybe 20 to 40 ppm). The stamp itself will shrink very significantly with a CTE of about 500 to 800 ppm, and the affixed backplane will shrink with a CTE of around 5 to 50 ppm, depending on the choice of material. It is this differential CTE between the permanently affixed backplane and the stamp that causes a complex pattern distortion that is sought to be avoided. None of the references cited, especially Everhart, recognize this problem in their disclosures.

Sangokoya discloses a process of producing aluminoxane derivatives and siloxy-aluminoxane materials used to enhance catalytic effect for polymerization of olefins. Applicant has discussed above the specificity of all aspects of his invention in order to obtain a useful product. Sangokoya again is non analogous art. There is no basis for including it with the Everhart and Franses references. Sangokoya teaches a list of siloxanes and how to make same. There is no suggestion of using those siloxanes in combination with Everhart or as Applicant has used them.

The reference speaks in general terms of reaction temperatures being in the range of 25 °C to 150 °C, but Sangokoya says nothing about tailoring curing conditions to precisely define the dimension and geometry of molded parts from these materials. The composition formed in accordance with Sangokoya's process is not the shaped article of commerce such as Applicant is producing.

Sangokoya does not mention two step curing, or does he mention long carefully-controlled end-use temperature cures followed by high temperature hardening steps. These are steps necessary to form an article. To reiterate, the only basis for the citation of this reference is to establish the existence of silicon compounds. The guiding precedent is: "*It is insufficient that the prior art disclosed the components of the patented device, either separately or in other combinations; there must be some teaching, suggestion or incentive to make the combination made by the inventor.*" **Northern Telecom, Inc. v. Datapoint Corp**. 908 F.2d 931, 15 USPQ 2d 1321 (Fed.Cir. 1990) No such suggestion is made in the references.

The reference to Franses is also a non-analogous art citation. It generally relates to the production of particles having specific shapes. It is a teaching relating to the typical resin/rubber blend in which the resin forms the matrix or continuous phase and the resin forms the discontinuous phase enveloped therein. The Franses invention seeks to produce spheroidal, ellipsoidal and other non-spherical polymer particles having a controlled cross-link density, chemical composition and dimensions. The elastomeric matrix used in Example 1 of Franses is a PDMS prepolymer which is not what Applicant discloses. The elastomer is not used by itself but rather is blended with the PVT microspheres disclosed. This results in a totally different product from that formed and obtained by Applicant. The fact that the resulting blend is cured for "4 to 24 hours" is the only similarity between the Franses reference and Applicant's claimed invention.

In the method of the present invention, the mold is filled with precursor material (not a resin/rubber blend) and this mold/precursor remains at a precisely controlled end-use temperature for many days or up to a week. This establishes the final cured dimensions of the microcontact printing stamp by having allowed a great majority of crosslink reactions to take place at that final

use temperature. The Franses blend would not function in the very specific dimensions required in Applicant's stamp. The final high temperature reaction cures and hardens the material but does so by reacting only a small residual number of crosslink sites; thereby hardening the element without inducing significant additional chemical shrinkage. Once the product cools down after the high temperature second step, it regains the dimensions it attained during the first long end-use temperature reaction, except for insignificant additional chemical shrinkage caused by the residual crosslinking that took place at the high temperature. It is rendered insignificant by expressly inverting the proportion of chemical crosslinks that are created at each of the two temperatures.

Applicant uses PRECISE control of temperature DURING the "room temperature" stage of the cure. Applicant uses the term "room temperature," but this is the end-use temperature, which is held very constant in a semiconductor clean-room setting. The molding is to be done at that precisely held and maintained temperature. In order to do so, it is necessary to do the curing either in such a temperature controlled environment as a clean room (e.g. make the stamps in a clean room where they will ultimately be used in microcontact printing operations) OR be kept under tightly controlled temperature conditions by hermetic sealing and immersion in a temperature controlled fluid bath.

As noted above, the references to Everhart, Sangokoya and Franses disclose entirely different processes, and are directed to areas totally different from the teaching objective of the present invention.

Certain of the references, which do disclose a cure, say nothing about maintaining a precise dimension. Shaping by molding does not address the specific "dimension" which Applicant needs for his invention to function properly.

As a result of the arguments submitted above to rebut the rejection of the claims under 35 U.S.C. §103, Applicant submits that the prior art does not allow or support the conclusion of obviousness that the Examiner seeks to establish.

The references to Everhart, Sangokoya and Franses are extremely broad "shot gun" type disclosures. It appears from a review of the references that if an element or step is included in the catalog of elements and steps cited in any of them, it is suitable to render obvious the present invention.

The references all provide a "shotgun" disclosure as to the composition constituents that are used in accordance with their invention. Considering the myriad number of polymers and steps that are disclosed in the cited references, the permutations and combinations of constituents they set up would not properly render the present invention obvious.

Applicant respectfully submits that the specificities of the cited disclosures do not rise to the level required to qualify as an appropriate reference with respect to Applicant's invention.

> *Further, the reference must describe the applicant's claimed invention sufficiently to have placed a person of ordinary skill in the field of the invention in possession of it. (Citations omitted)* In re Lonnie T. Spada et al., 911 F.2d 705, 708 (Fed. Cir. 1990)

These references as cited, alone or in combination, do not disclose or even imply the specifics required in the present invention. In her rejection, the Examiner is picking and choosing elements to the exclusion of what the references as a whole teach to one skilled in the art. To arrive at Applicant's invention, the person skilled in the art would have to randomly pick and choose among a substantial number of different polymers and steps found in the references with

absolutely no guidance whatsoever to direct him/her to the composition claimed by Applicant. Based upon his/her knowledge of the properties of the prior art polymers and the step used to obtain the novel product, it is unlikely that the cited references would be used as a source.

In order to analyze the propriety of the Examiner's rejections in this case, a review of the pertinent applicable law relating to 35 U.S.C. § 103 is warranted. The Examiner has applied the various references discussed above using selective combinations to render obvious the invention.

The Court of Appeals for the Federal Circuit has set guidelines governing such application of references. These guidelines are, as stated are found in Interconnect Planning Corp. v. Feil, 774 F.2d 1132, 1143, 227 USPQ, 543, 551:

> *When prior art references require selective combination by the court to render obvious a subsequent invention, there must be some reason for the combination other than hindsight gleaned from the invention itself.*

A representative case relying upon this rule of law is Uniroyal, Inc. v. Rudkin-Wiley Corp., 837 F.2d 1044, 5 USPQ 2d 1434 (Fed. Cir. 1988). The district court in Uniroyal found that a combination of various features from a plurality of prior art references suggested the claimed invention of the patent in suit. The Federal Circuit in its decision found that the district court did not show, however, that there was any teaching or suggestion in any of the references, or in the prior art as a whole, that would lead one with ordinary skill in the art to make the combination. The Federal Circuit opined:

> *Something in the prior art as a whole must suggest the desirability, and thus the obviousness, of making the combination.* [837 F.2d at 1051, 5 USPQ 2d at 1438, *citing Lindemann*, 730 F.2d 1452, 221 USPQ 481, 488 (Fed. Cir. 1984).]

Applicant respectfully submits that there is no basis for the combination of the aforementioned references cited by the Examiner. Applicant has pointed out how the references teach in different directions. The Examiner has selected steps from disparate references for the sake of showing the individual steps claimed without regard to the total teaching of the references.

As noted, the Examiner is improperly picking and choosing. It is a piecemeal construction of the invention. Such piecemeal reconstruction of the prior art patents in light of the instant disclosure is contrary to the requirements of 35 U.S.C. § 103.

> *The ever present question in cases within the ambit of 35 U.S.C. § 103 is whether the subject matter as a whole would have been obvious to one of ordinary skill in the art following the teachings of the prior art at the time the invention was made. It is impermissible within the framework of Section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art.* (Emphasis in original) In re Wesslau 147 U.S.P.Q. 391, 393 (CCPA 1965)

This holding succinctly summarizes the Examiner's application of references in this case, because she did in fact pick and choose so much of the Everhart, Sangokoya and Franses references to support her position and did not cover completely in the Office Action the full scope of what these varied disclosure references fairly suggest to one skilled in the art.

Further, the Federal Circuit has stated that the Patent Office bears the burden of establishing obviousness. It held this burden can only be satisfied by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the reference.

> *Obviousness is tested by "what the combined teachings of the references would have suggested to those of ordinary skill in the art."* In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). *But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination."* ACS Hosp. Sys., 732 F.2d at 1577, 221 USPQ at 933. [837 F.2d at 1075, 5 USPQ 2d at 1599.]

The court concluded its discussion of this issue by stating that teachings or references can be combined only if there is some suggestion or incentive to do so.

The arguments presented relating to Claim 1 are incorporated by reference in response to Claims 7 and 8. In view of the amendments and cancellations made herein, Applicant believes that the claims are in condition for allowance. However if there are issues arising by virtue of this amendment which could be resolved by a telephone conference, Applicant's attorney would be

pleased to speak with the Examiner concerning such matter(s) at a mutually convenient time. The Examiner is requested to contact Applicant's attorney by telephone.

The Commissioner is requested to grant a two (2) month extension within which to respond to the Official Action noted above. The Commissioner is authorized to charge Deposit Accout 02-1651 for the required late fee.

Respectfully Submitted,

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I hereby certify that this paper is being mailed via First Class Mail postage prepaid on the date listed below addressed to Commissioner of Patents & Trademarks, Post Office Box 1450, Alexandria, VA 22313-1450.

October 3, 2006

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